## REMARKS

**Status of the Claims:**

Claims 1 – 14 are pending.

Claims 1 – 14 are currently rejected.

Claims 10 and 12 – 14 are cancelled.

Claims 1, 3 – 5, 8, 9 and 11 are currently amended.

Claim 11 is a new claim.

**Amendments to the Claims:**

No new matter has been introduced by way of the claim amendments.

Claim 1 is presently amended to include the limitations of dependent claim 10, namely that 'the defunctionalized product is resuspendable in a second solvent.' The limitations of claim 10 now recite a second solvent for purposes of clarity. Claim 1 is also amended in step (a) to specify that the functionalized carbon nanotubes are suspended in a first solvent, for consistency with the incorporated limitations of claim 10. Claim 1 is further amended in step (a) to recite formation of a 'suspension comprising the first solvent and the quantity of functionalized carbon nanotubes'.

Claims 3 and 4 are presently amended for purposes of antecedent agreement with amended claim 1. Claim 4 has been amended to delete o-dichlorobenzene from the Markush group. New claim 15 has been added to recite that the first solvent comprises o-dichlorobenzene. New claim 15 is supported at least by original claim 4. Claim 4 is also amended to correct a minor grammatical error.

Claim 5 is presently amended to recite that the suspension is completely enclosed in a pressure vessel. Support for this amendment may be founding at least paragraphs [0013], [0038] and [0048] of the instant specification.

Claim 8 is presently to clarify what is described by the defunctionalized products recited in the Markush group. The descriptions of the Markush group members have been amended to match language found in the instant specification. A description of completely defunctionalized carbon nanotubes may be found in the specification in at least paragraphs [0040] and [0041]. A description of partially defunctionalized carbon nanotubes may be found in the specification in at least paragraphs [0015], [0026], [0037], [0040], [0041] and [0053].

Claim 9 is amended to replace the term 'functionally uniform' with 'generally homogenous'. Support for the term 'generally homogenous' may be found in the specification in at least paragraph [0026].

Claim 11 is presently amended to clarify that the functionalized carbon nanotubes are selectively defunctionalized according to their different (n,m) types.

## I. Claim Rejections Under 35 U.S.C. § 102(b)

Claims 1 – 6, 8, 10 and 12 – 14 stand rejected under 35 U.S.C. § 102(b) as unpatentable over WO/2002/060812 (hereinafter, *Tour*). Office Action, page 2. Applicants respectfully traverse the rejection of these claims.

*I.1 Rejection of Claims 1 – 6, 8 and 10*

The Examiner asserts that *Tour* teaches the elements of Applicants' claim 1 in a combination of claims. Specifically, the Examiner asserts that *Tour* teaches dispersing a plurality of functionalized carbon nanotubes in a solvent (*Tour* claim 2) and then thermally defunctionalizing by heating the functionalized carbon nanotubes to yield a defunctionalized product (*Tour*, claims 28 – 30). With regard to dependent claims 2 – 6, 8, and 10, the Examiner asserts that *Tour* teaches single-wall carbon nanotubes of claim 2, thermally stable solvents of claim 3, dichlorobenzene of claim 4, a completely closed vessel of claim 5, nanotubes dispersed in a polymer of claim 6, defunctionalized product of claim 8, and defunctionalized product of claim 10.

The standard of review for establishing anticipation under 35 U.S.C. § 102 is set forth as follows. "A claim is anticipated only if each and every element as set forth in the claim is found,

either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987); MPEP § 2131.

Applicants respectfully traverse the Examiner's characterization of claim 1 as being anticipated by *Tour*. Applicants respectfully submit that *Tour* teaches a method that comprises dispersing a plurality of functionalized carbon nanotubes in a solvent (*Tour* claim 2). *Tour* teaches that the method may further comprise removing functional moieties from the derivatized carbon nanotubes (*Tour* claim 28), where the removal step comprises heating the derivatized carbon nanotubes (*Tour* claim 29). *Tour* claim 28 does not recite that removing follows dispersing. Further, *Tour* claim 29 does not recite heating the solvent. Applicants respectfully assert that *Tour* does not teach, either expressly or inherently, heating a suspension comprising a solvent and a quantity of functionalized carbon nanotubes. In contrast, Applicants' amended claim 1 requires heating a suspension comprising a solvent and a quantity of functionalized carbon nanotubes. Hence, claim 1 is not anticipated by *Tour*.

Applicants also respectfully traverse the Examiner's characterization of claim 10, which is now incorporated as a limitation of claim 1, as being anticipated by *Tour*. With regard to claim 10, the Examiner asserts that *Tour* discloses "defunctionalized product as functional moieties removed carbon nano tubes [sic] that were functionalized." Applicants respectfully assert that this statement is not germane to whether a defunctionalized product is resuspendable in a second solvent. Applicants present evidence that the defunctionalized carbon nanotubes of Applicants' methods and those of *Tour* have different solubility properties in at least paragraphs [0010], [0012], [0042] and [0049] – [0053] of the instant specification. Applicants respectfully assert that *Tour* does not teach, either expressly or inherently, heating a suspension comprising a first solvent and a quantity of functionalized carbon nanotubes to a temperature that will thermally defunctionalize the functionalized carbon nanotubes to form a defunctionalized product, where the defunctionalized product is resuspendable in a second solvent. In contrast, Applicants' amended claim 1 requires heating a suspension comprising a first solvent and a quantity of functionalized carbon nanotubes to a temperature that will thermally defunctionalize the functionalized carbon nanotubes to form a defunctionalized product, where the defunctionalized product is resuspendable in a second solvent. Hence, *Tour* does not anticipate

claim 1, as this claim presently stands amended.

Applicants respectfully traverse the Examiner's characterization of claim 4 as being anticipated by *Tour*. The Examiner asserts that *Tour* teaches o-dichlorobenzene of claim 4. In the interests of advancing prosecution, claim 4 has been amended to delete o-dichlorobenzene from the Markush group. Hence, claim 4, as amended, is not anticipated by *Tour*. Claim 15 has been added to recite that the first solvent comprises o-dichlorobenzene. New claim 15 is supported by original claim 4. Applicants respectfully assert that *Tour* does not teach, either expressly or inherently, heating a suspension comprising a first solvent and a quantity of functionalized carbon nanotubes, where the solvent is o-dichlorobenzene. In contrast, Applicants new claim 15, dependent from amended claim 1, requires heating a suspension comprising a first solvent and a quantity of functionalized carbon nanotubes, where the first solvent is o-dichlorobenzene. Hence, new claim 15 is not anticipated by *Tour*.

Applicants also respectfully traverse the Examiner's characterization of claim 5 as being anticipated by *Tour*. The Examiner asserts that *Tour* teaches that synthesis of compound 10 is conducted where the suspension is completely enclosed in a vessel. Applicants respectfully assert that the synthesis of compound 10 in *Tour* is not germane to Applicants' claim 5, at least since compound 10 is not a functionalized carbon nanotube or defunctionalized carbon nanotube product. Instead, compound 10 in *Tour* is an aromatic amine compound (see Figure 2 of *Tour*) that is a precursor to functionalized carbon nanotubes. Therefore, Applicants respectfully assert that *Tour* does not teach, either expressly or inherently, heating a suspension comprising a first solvent and a quantity of functionalized carbon nanotubes, wherein the suspension is completely enclosed in a pressure vessel. In contrast, Applicants' claim 5, dependent from amended claim 1, requires heating a suspension comprising a first solvent and a quantity of functionalized carbon nanotubes, wherein the suspension is completely enclosed in a pressure vessel. Hence, claim 5 is not anticipated by *Tour*.

Since *Tour* does not expressly or inherently teach all of the limitations of claim 1, as amended, Applicants respectfully assert that claim 1 is patentable over *Tour* under 35 U.S.C. § 102(b). Further, since *Tour* does not expressly or inherently teach all of the limitations of each of Claims 2 – 9, 11 and 15, in combination with the limitations of Claim 1, each of Claims 2 – 9,

11 and 15 is patentable over *Tour* under 35 U.S.C. § 102(b). Further, Claims 2 – 9, 11 and 15 depend either directly or indirectly from allowable claim 1 and are patentable for at least the same reasons. *In re Fine,* 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). Therefore, Applicants respectfully request that the Examiner's rejection of claims 1 – 6, 8 and 10 under 35 U.S.C § 102(b) be withdrawn in view of the foregoing remarks.

*I.2 Rejection of Claims 12 – 14*

The Examiner asserts that *Tour* teaches the elements of Applicants' claim 12 in a combination of claims. The Examiner asserts that *Tour* teaches dispersing derivatized carbon nanotubes in a polymer host, wherein the functional groups are bound or not chemically bound to the polymer host, and thermally defunctionalizing by heating after the dispersing step. In regard to dependent claims 13 and 14, the Examiner asserts that *Tour* teaches single-wall carbon nanotubes of claim 13 and defunctionalized product as recited in claim 14.

Applicants hereby cancel claims 12 – 14, rendering this rejection moot. Applicants reserve the right to prosecute claims 12 – 14 in a continuing application.

## II. Claim Rejections Under 35 U.S.C. § 103(a)

*II.1 Rejection of Claims 7 – 9*

Claims 7 – 9 stand rejected under 35 U.S.C. § 103(a) as unpatentable over *Tour* in view of Panhuis, *et al.,* "Characterization of an Interaction Between Functionalized Carbon Nanotubes and an Enzyme", Journal of Nanoscience and Technology, 3 (2003), pp. 209 – 213 (hereinafter, *Panhuis*). Office Action, page 5. Applicants respectfully traverse the rejection of these claims.

With regard to claim 7, the Examiner asserts that *Tour* does not teach application of a surfactant to a dispersion of carbon nanotubes suspended in a solvent, although *Panhuis* teaches application of the surfactant Triton X-100 to a solution of carbon nanotubes. With regard to claim 9, the Examiner asserts that the nanotube after defunctionalization is functionally uniform. Applicants note that although claim 8 stands rejected under 35 U.S.C. § 103(a) as unpatentable over *Tour* in view of *Panhuis*, the Examiner has not provided the reasons under which this claim is rejected in view of these references.

For rejections under 35 U.S.C. § 103(a), all claim limitations must be taught or suggested by the prior art to establish obviousness. *In re Royka,* 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974). Applicants respectfully assert that neither *Tour* nor *Panhuis*, either separately or in combination, teach or suggest all of the limitations of Applicants' claims 1 and 7 – 9, as is required to render these claims obvious. As discussed hereinabove for rejections made under 35 U.S.C. § 102(b), Applicants respectfully assert that *Tour* does not teach or suggest heating a suspension comprising a first solvent and a quantity of functionalized carbon nanotubes to a temperature that will thermally defunctionalize the functionalized carbon nanotubes to form a defunctionalized product, where the defunctionalized product is resuspendable in a second solvent. In contrast, Applicants' amended claim 1 requires heating a suspension comprising a first solvent and a quantity of functionalized carbon nanotubes to a temperature that will thermally defunctionalize the functionalized carbon nanotubes to form a defunctionalized product, where the defunctionalized product is resuspendable in a second solvent. Likewise, *Panhuis* does not teach or suggest either of these limitations now required by independent claim 1. Therefore, Applicants respectfully assert that independent claim 1 is patentable over *Tour* in view of *Panhuis* under 35 U.S.C. § 103(a).

Claims 7 – 9 depend from allowable claim 1 and are patentable for at least the same reasons. In further regard to the non-obviousness of claim 7, Applicants provide the following additional remarks. Although *Panhuis* teaches solubilization of carbon nanotubes using a surfactant, neither *Tour* nor *Panhuis* teach or suggest a defunctionalized product that is resuspendable in a second solvent. Further, Applicants respectfully assert that there exists insufficient motivation or predictability to combine a surfactant in a solution of functionalized carbon nanotubes and heat the surfactant solution to affect defunctionalization and a form defunctionalized product that is resuspendable. The standard of predictability for establishing obviousness is set forth as follows:

> "A rationale to support a conclusion that a claim would have been obvious is that all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded nothing more than predictable results to one of ordinary skill in the art." MPEP 2143.02.
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> "The *KSR* Court noted that obviousness cannot be proven merely by showing that

> the elements of a claimed device were known in the prior art; it must be shown that those of ordinary skill in the art would have had some 'apparent reason to combine the known elements in the fashion claimed.'" *Ex parte Whalen*, 89 USPQ2d at 1084 citing *KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct. at 1741.

Applicants respectfully assert that claim 7 is non-obvious over *Tour* in view of *Panhuis*, since one of ordinary skill in the art could not readily predict the outcome of heating a surfactant-wrapped, functionalized carbon nanotube solution, particularly to form a defunctionalized product that is resuspendable in a second solvent. There is no teaching or suggestion in either *Tour* or *Panhuis* concerning how inclusion of a surfactant in the step of heating the suspension would facilitate the formation of a resuspendable defunctionalized product.

In view of the foregoing remarks and amendments, Applicants respectfully assert that independent claim 1 and dependent claims 7 – 9 are patentable over *Tour* in view of *Panhuis* under 35 U.S.C. § 103(a). Therefore, Applicants respectfully request that the Examiner's rejection of claims 7 – 9 under 35 U.S.C § 103(a) be withdrawn.

*Rejection of Claim 11*

Claim 11 stands rejected under 35 U.S.C. § 103(a) as unpatentable over *Tour* in view of Iijima, *et al.,* "Single-shell carbon nanotubes of 1-nm diameter", Nature, 363 (1993), pp. 603 – 605 (hereinafter, *Iijima*). Office Action, pages 6 – 7. Applicants respectfully traverse the rejection of this claim.

The Examiner asserts that at the time of invention, it would have been obvious to a person of ordinary skill in the art to carry out the defunctionalization of nanotubes characterized by an (n,m) notation. The Examiner asserts that a prior knowledge of (n,m) vectors is expected to selectively defunctionalize the nanotubes.

Applicants respectfully assert that neither *Tour* nor *Iijima*, separately or in combination, teach or suggest all the limitations of Applicants' claims 1 or 11, as is required to render these claims obvious. As discussed hereinabove for rejections made under 35 U.S.C. § 102(b), Applicants respectfully assert that *Tour* does not teach or suggest heating a suspension comprising a first solvent and a quantity of functionalized carbon nanotubes to a temperature that will thermally defunctionalize the functionalized carbon nanotubes to form a defunctionalized

product, where the defunctionalized product is resuspendable in a second solvent. In contrast, Applicants' amended claim 1 requires heating a suspension comprising a first solvent and a quantity of functionalized carbon nanotubes to a temperature that will thermally defunctionalize the functionalized carbon nanotubes to form a defunctionalized product, where the defunctionalized product is resuspendable in a second solvent. Likewise, *Iijima* does not teach or suggest either of these limitations now required by independent claim 1. Therefore, Applicants respectfully assert that independent claim 1 is patentable over *Tour* in view of *Iijima* under 35 U.S.C. § 103(a).

Claim 11 depends from allowable claim 1 and is patentable for at least the same reasons. In further regard to the non-obviousness of claim 11, Applicants provide the following additional remarks. Although (n,m) vectors are taught by *Iijima*, Applicants respectfully assert that *Iijima* uses the (n,m) vectors only to describe whether a particular carbon nanotube is semiconducting (for example, see *Iijima* p. 605). Applicants respectfully assert that there is no teaching or suggestion in *Iijima* that functionalized carbon nanotubes may be selectively defunctionalized according to their different (n,m) types. Applicants respectfully assert that the Examiner has improperly cited *Iijima* as a reference and used hindsight in determining the obviousness of claim 11. The standard for using hindsight in regard to establishing obviousness is set forth as follows:

> "If identification of each claimed element in the prior art were sufficient to negate patentability, very few patents would ever issue. Furthermore, rejecting patents solely by finding prior art corollaries for the claimed elements would permit an examiner to use the claimed invention as a blueprint for piecing together elements in the prior art to defeat patentability of the claimed invention. Such an approach would be 'an illogical and inappropriate process by which to determine patentability.' " *In re Rouffet*, 47 USPQ2d 1453, 1457 (Fed. Cir. 1998) citing *Sensonics, Inc. v. Aerosonic Corp.*, 81 F.3d 1566, 1570, 38 USPQ2d 1551, 1554 (Fed. Cir. 1996).
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> "To reach a proper determination under 35 U.S.C. 103, the examiner must step backward in time and into the shoes worn by the hypothetical "person of ordinary skill in the art" when the invention was unknown and just before it was made. In view of all factual information, the examiner must then make a determination whether the claimed invention "as a whole" would have been obvious at that time to that person. Knowledge of applicant's disclosure must be put aside in reaching this determination, yet kept in mind in order to determine the "differences,"

> conduct the search and evaluate the "subject matter as a whole" of the invention. The tendency to resort to "hindsight" based upon applicant"s disclosure is often difficult to avoid due to the very nature of the examination process. However, impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art." M.P.E.P § 2142.

Applicants respectfully assert that the Examiner has improperly using hindsight in applying *Iijima* as a reference, since *Iijima* at least does not teach or suggest selective defunctionalization of functionalized carbon nanotubes (or even reference functionalized carbon nanotubes at all).

In view of the foregoing remarks and amendments, Applicants respectfully assert that independent claim 1 and dependent claim 11 are patentable over *Tour* in view of *Iijima* under 35 U.S.C. § 103(a). Therefore, Applicants respectfully request that the Examiner's rejection of claim 11 under 35 U.S.C § 103(a) be withdrawn.

## CONCLUSIONS

Claims 1 – 9, 11 and 15 remain pending in the application. Applicants respectfully submit that claims 1 – 9, 11, and 15, as these claims presently stand amended, are in a condition for allowance based on the remarks presented hereinabove.

If additional fees are due and are not included, the Director is hereby authorized to charge any fees or credit any overpayment to Deposit Account Number 23-2426 of Winstead PC (referencing matter 11321-P079WOUS).

If the Examiner has any questions or comments concerning this paper or the present application in general, the Examiner is invited to call the undersigned at 713-650-2782.

Respectfully submitted,

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